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Original Articles

Experimental increase in accommodative potential after neodymium:yttrium–aluminum–garnet laser photodisruption of paired cadaver lenses

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PURPOSE: Loss of lens elasticity is one of several proposed mechanisms responsible for the decline in accommodation with age and is the most accepted explanation for presbyopia. We wish to confirm the lens elasticity premise and attempt to experimentally reverse the age-dependent loss of accommodative potential as measured by polar strain.

DESIGN: Experimental human autopsy eye study.

PARTICIPANTS AND CONTROLS: Thirty-six cadaver lenses were tested to determine the age-dependent polar strain. Eleven lens pairs were then tested with one lens treated with neodymium:yttrium–aluminum–garnet (Nd:YAG) laser and the other left untreated before rotation as an age control.

TESTING: Using a custom-made rotational apparatus (described by Fisher, 1971), freshly excised cadaver lenses (<48 hours postmortem) were rotated at 1000 rpm on a 9-mm diameter pedestal to simulate the physiologic pull of the zonules. Lenses were initially tested to determine the age-dependent polar strain. One lens in a pair was then treated with an Nd:YAG laser and the other left untreated before testing. Treatment consisted of 100 suprathreshold pulse placed in a central annular pattern of 2- to 4-mm diameter. Treatment energies varied from 2.5 to 7.0 mJ/pulse, depending on the relative clarity of the lenses. Polar strain was both microscopically measured and calculated from projected photographs before and after rotation of both lased and unlased lenses. Statistically

significant differences were determined by paired t test.

MAIN OUTCOME MEASURES: Polar strain (decrease in axial thickness with rotation) of the lens.

RESULTS: An age-dependent decrease in polar strain was observed that paralleled the findings of Fisher. Both measured and projected polar strain were greater in the lased than unlased lens, and this difference was highly significant by paired t test ($P = 0.001$ and $P = 0.004$, respectively).

CONCLUSIONS: Age-dependent loss of lens elasticity (polar strain) can be experimentally reversed (increased) by selective intralenticular photodisruption.

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